

# Key

## Physics 103 Quiz #3, Thursday (2/14/2013)

Show all work in order to obtain points for problems

Name: \_\_\_\_\_

1. (2 pts) A temperature of 233 K equals which of the following?

a. 506°C

b. 40°C

c. -40°F

d. 40°F

$$T_C = T_K - 273.15 = -40.15^\circ\text{C}$$

$$T_F = \frac{9}{5} T_C + 32$$

$$= \left(\frac{9}{5}\right) (-40.15) + 32$$

$$= -40.27^\circ\text{F}$$

2. (3 pts) A rectangular steel plate with dimensions of 30 cm × 25 cm is heated from 20°C to 220°C. What is its change in area? (Coefficient of linear expansion for steel is  $11 \times 10^{-6}/^\circ\text{C}$ .)

a. 0.82 cm<sup>2</sup>

b. 1.65 cm<sup>2</sup>

c. 3.3 cm<sup>2</sup>

d. 6.6 cm<sup>2</sup>

$$\Delta A = \gamma \Delta T A_0$$

$$= (2\alpha) \Delta T A_0$$

$$= 2(11 \times 10^{-6} \text{ C}^{-1})(220 - 20)(30 \text{ cm} \times 25 \text{ cm})$$

$$= 3.3 \text{ cm}^2$$

3. (5 pts) A spherical air bubble originating from a scuba diver at a depth of 18.0 m has a diameter of 1.0 cm. What will the bubble's diameter be when it reaches the surface? (Assume constant temperature.)

a. 0.7 cm

b. 1.0 cm

c. 1.4 cm

d. 1.7 cm

$$PV = nRT$$

$$V_1 = \frac{nRT_1}{P_1}$$

$$V_2 = \frac{nRT_2}{P_2}$$

$$\frac{V_2}{V_1} = \frac{P_1}{P_2} = \frac{\rho gh + P_2}{P_2}$$

$$= 1 + \frac{\rho gh}{P_2}$$

$$= 1 + \frac{(1000 \text{ kg/m}^3)(9.8)(18)}{1.01 \times 10^5}$$

$$= 2.75$$

$$\frac{V_2}{V_1} = \frac{4/3 \pi r_2^3}{4/3 \pi r_1^3}$$

$$\Rightarrow \frac{r_2}{r_1} = \left(\frac{V_2}{V_1}\right)^{1/3}$$

$$d_2 = 2.4 d_1 = 1.4 \text{ cm}$$